(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 921 490 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
01.09.2004 Bulletin 2004/36

(51) Int Cl.[7]: **G06K 7/00**

(21) Application number: **98122985.9**

(22) Date of filing: **03.12.1998**

(54) **Electrical connector device for co-operating with a removable electronic medium**

Elektrischer Verbinder für das Kooperieren mit einem entfernbaren elektronischen Medium

Connecteur électrique pour coopérer avec un support électronique séparable

(84) Designated Contracting States:
BE DE FR GB IT NL SE

(30) Priority: **03.12.1997 FR 9715203**

(43) Date of publication of application:
09.06.1999 Bulletin 1999/23

(73) Proprietor: **AMPHENOL-TUCHEL ELECTRONICS GmbH**
D-74080 Heilbronn (DE)

(72) Inventor: **Lescoat, Jean-François**
Amphenol-Tuchel Elect. GmbH
74080 Heilbronn (DE)

(74) Representative: **Wagner, Karl H., Dipl.-Ing. et al**
WAGNER & GEYER
Patentanwälte
Gewürzmühlstrasse 5
80538 München (DE)

(56) References cited:
DE-A- 3 931 506
US-A- 4 675 516
US-A- 5 259 777

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 0 921 490 B1

Description

[0001] The present invention relates to an electrical connector device for co-operating with a removable electronic medium, in particular an electronic memory card, and to an electronic memory card reader using said electrical connector device.

BACKGROUND OF THE INVENTION

[0002] Electronic memory cards are being used more and more widely, e.g. to give access to certain premises or to obtain certain services, or indeed to make certain payments. An electronic memory card is essentially constituted by a flat rectangular body in which an electronic module is inserted, which module has external electrical contact areas on its outside face.

[0003] To use such cards, it is necessary for a card to be inserted into a card reader which enables electrical connection to be established between the various external contact areas on the card and the electronic circuits of the reader. Such electrical connections serve firstly to provide electrical power to the integrated circuit of the card, and secondly to transmit a certain amount of information and instructions to and from the card.

[0004] Given the wide variety of utilizations for such cards, card readers must in turn be capable of accepting various configurations depending on the utilization of the card. It is therefore advantageous to have card readers available that present configurations that differ depending on the utilization made thereof, such card readers generally be required to be as low-profile as possible and also as low cost as possible.

[0005] In particular, a card reader must include an electrical connector device made up of a certain number of flexible conductive springs which are disposed in such a manner that each spring makes electrical contact with one of the external electrical contact areas of the card when the card is inserted in the reader. These flexible electrical contacts are naturally designed to be connected electrically to various electronic components of the reader to make it possible in particular to read the information contained in the card or to write information for the purpose of performing various operations, with the contacts also serving to supply the card with electricity. It will be understood that it is advantageous to have available an electrical connector device which is as highly integrated as possible inside the reader and which is capable of being used in different reader configurations, which configurations may have respective special cases adapted to their functions.

[0006] Circumstances other than readers also exist in which it is necessary to establish an electrical connection with a removable electronic medium provided with at least one external electrical contact area. This applies, for example, to electronic keys.

[0007] U.S. patent No. 4,675,516 discloses an electrical connector device for cooperation with a removable electronic medium in the form of an electronic memory card. Further an isolating partition having electric contact elements mounted on a first face is disclosed. The electrical contact element also referred to as a conductive leaf has a flexible end which projects into an opening. The leaf transverses the opening in the partition, and the free end of the leaf forms a contact surface. The contact element comprises at about its center an angled portion which is cemented in another opening in the partition. As far as the connection with a conductive strip is concerned, an angled end of the leaf penetrates a still further opening in the isolating partition, and is fixed in a conductive filling to electrically connect the leaf to said conductive strip deposited on a second face of the partition.

OBJECTS AND SUMMARY OF THE INVENTION

[0008] The object of the present invention is achieved by the electrical connector device according to claim 1.

[0009] It will be understood that by means of the electrical connector device of the invention, in a card reader, the flexible electrical springs for making electrical connection with the card are mounted directly on the insulating board of the printed circuit which itself receives at least some of the electronic components of the card reader. This completely eliminates the need to provide a particular mechanical structure including the resilient electrical contact springs, said structure needing to be fitted to the board and to be electrically connected to the electronic components of the reader. It will be understood that this simplifies the structure of the reader and that its thickness can be reduced very significantly, because there is no longer any separate mechanical structure for the electrical connector device.

[0010] Another object of the invention is to provide an electronic memory card reader which uses the electrical connector device of the type defined above.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The invention will be better understood on reading the following description of an embodiment of the invention given by way of non-limiting example. The description refers to the accompanying figures, in which:

Figure 1 is a simplified exploded view of the electrical connector device having a plurality of electrical contacts;

Figure 2 is a perspective view showing the conductive springs mounted on the printed circuit board;

Figure 3 is a perspective view of a complete electrical connector device;

Figure 4 is an exploded view of an electronic memory card reader using the electrical connector device of Figures 1 to 3;

Figure 5 is a longitudinal vertical section view of an electronic memory card reader of the kind shown in

Figure 4; and
Figure 6 is a vertical section view of an electronic key using the connector device.

MORE DETAILED DESCRIPTION

[0012] With reference initially to Figures 1 and 2, there follows a description of the principles of the electronic connector device as applied to electronic memory cards.

[0013] The device comprises a board 12 of insulating material of the type used for printed circuits. This board is of sufficient strength. Slots such as 14 are formed through the board 12 in positions that correspond to the positions of the external electrical contact areas of the electronic memory card. In the most common configuration, these slots 14 are thus disposed in a 2 x 4 matrix. In Figure 1, there can thus be seen slots 14.1 to 14.8. Each of these slots is designed to receive a portion of an electrical connector element given overall reference 16. Each electrical connector element is constituted by a resilient spring of conductive material, e.g. copper or brass. The connector element 16 has a first end 18 for connection and fixing purposes, a folded intermediate zone 20 constituting a zone for making contact with the external contact areas of an electronic memory card, and a free end 22 that is substantially plane. Each slot 14 is associated with an electrical connection tab 24 designed to receive the fixing end 18 of the corresponding connector element. When the fixing portion 18 is soldered to the tab 24 the angled portion of the electrical contact 20 passes through the corresponding slot 14 and projects from the bottom face of the board 12. When the spring 16 is not deformed, its free end 22 presses against the top face of the plate 12.

[0014] Figure 2 shows the various electrical connector elements 14 soldered to the tabs of the insulating board 12.

[0015] It will be understood that by means of this particular disposition, the insulating printed circuit board 12 performs two functions. Firstly it serves as a mechanical support and as a support for positioning the various electrical connector elements 16, and secondly it acts as a printed circuit insofar as it is possible, as explained below, to provide conductive tracks for connecting the contact tabs 24 to various electronic components also mounted on the board 12 and constituting the circuits of the reader in which the electrical connector device is integrated.

[0016] Two additional slots 26 and 28 are preferably also provided through the insulating board 12, with resilient elements 30 and 32 being mounted therein that have the same shape as the conductive springs and that serve as contacts for detecting when an electronic memory card reaches the end of its stroke on being inserted into the card reader. These conductive springs 30 and 32 are also soldered to conductive tabs such as 34 and 36 which are likewise connected to conductive tracks formed on the printed circuit board.

[0017] It will be understood that when an electronic memory card is inserted in the reader, as explained below, the thickness of the card causes the contact zones 20 of the connector elements 16 to be raised. Because of the resilience of the springs and because the ends 22 thereof are not secured to the printed circuit board, good electrical contact is indeed obtained with pressure being applied between the electrical connector elements 16 and the external connection areas of the electronic memory card.

[0018] Figure 3 shows the printed circuit board 12 in greater detail, its flexible conductive springs 16 being fixed to their contact tabs and various conductive tracks such as 40, 42, and 44 enabling the various electrical contact elements to be connected to the connection areas 45 of electronic components mounted on the printed circuit 12.

[0019] With reference now to Figures 4 and 5, an embodiment of an electronic memory card reader is described that makes use of an electrical connector device 10 of the type described above.

[0020] Figure 4 shows the electrical connector device 10 constituted by the printed circuit board 12 and its flexible electrical contact springs 16 together with various electronic components A, B, and C which are connected to one another and/or to the electrical contacts 16 via conductive tracks formed on the insulating board 12 by deposited conductor material. For example, the component C may be a liquid crystal display for displaying information relating to use of the electronic memory card or to its state. In this figure, there can also be seen other component parts of the card reader 50, and the memory card itself is referenced 52. The card reader comprises a bottom half-shell 45 having a rim 56 defining a front insertion slot 58 for the electronic memory card 52. This bottom half-shell also defines a housing 60 for receiving the electronic memory card while it is being processed.

[0021] The card reader also has a top half-shell 62 with a rim 64 that can be snap-fastened to the rim 56 of the bottom half-shell. As shown more clearly in Figure 5, the two half-shells have portions in relief such as 66 and 68 enabling the electrical connector device 10 to be secured between the half-shells in such a manner that the housing 60 for an electronic memory card is defined by the bottom wall 66 of the bottom half-shell 54 and by the bottom face of the printed circuit board 12, this being the face of the board 12 through which the electrical contact springs 16 project, as can be more clearly in Figure 5.

[0022] The board 12 preferably has 2n slots 14, with the slots being disposed in a matrix of 2 rows by n columns.

[0023] With reference now to Figure 6, a particular use of the electrical connector device for implementing an electronic key is described. In this embodiment, the connector device has only one contact spring.

[0024] In Figure 6, there can be seen the body 60 of

the key and the shank 62 thereof. The shank is slidably mounted in a cavity 64 of the key body. A mechanism (not shown) enables the shank 62 to be moved from a position in which it is retracted inside the body (out of service) and an extended position (for use).

[0025] A portion of the bottom wall of the cavity 64 is constituted by the electrical connector device 66. This device is constituted by a printed circuit 68 pierced by an orifice 70. The bottom face 68a has a conductive track 72 connected to circuits 74 fixed on this face.

[0026] A flexible spring projects via the orifice 70 from the top face 68b of the printed circuit. This spring 76 makes contact with the conductive track 80 on the shank 62 of the key.

Claims

1. An electrical connector device 10 for co-operating with a removable electronic medium (52) provided with at least one external electrical contact area, the device (10) comprising:

   a board (12) of insulating material having a first face and a second face and provided with at least one slot (14);
   at least one electrical connector element (16) in the form of a resilient conductive spring; each electrical connector element (16) having a fixing end (18) and a contact zone (20) for contacting one of the external contact areas of said medium;
   at least one electrical connection tab (24), said at least one connection tab (24) being disposed on the first face of said board (12) close to said at least one slot (14);
   at least one conductive track (40) formed on the first face of the board (12) to connect said connection tab (24) electrically to at least one contact terminal;
   said at least one electrical connector element (16) being fixed to said at least one electrical connection tab (24) via its fixing end (18), the contact zone or portion (20) of each connector element (16) projecting from the second face of said board (12) by passing through said slot, and wherein each electrical connector element (16) comprises a planar portion forming the fixing end (18), a folded intermediate portion (20) forming the contact zone, and a second planar end designed to bear against the top face of said board (12) when the electrical connector element (16) is not elastically deformed.

2. An electrical connector device according to claim 1, further comprising at least one electronic component (A, B, C) fixed on said first face and connected to said at least one electrical connector element (16).

3. An electrical connector device according to claim 1, having a plurality of slots (14.1-14.8), a plurality of electrical connector elements (16), and a plurality of conductive tracks (40, 42, 44).

4. An electrical connector device according to claim 1, wherein said board (12) has 2n slots, the slots being disposed in a matrix of 2 rows by n columns.

5. An electrical connector device according to claim 4, wherein said insulating board (12) has an additional slot (26) provided with an additional electrical connector element forming an end-of-stroke detector.

6. An electrical memory card reader using an electrical connector device according to one of claims 1-5, the reader comprising:

   a top half-shell;
   a bottom half-shell defining an insertion slot for an electronic memory card and an internal housing for receiving said card; and
   means for fixing the insulating board of said electrical connector device between said half-shells.

Patentansprüche

1. Eine elektrische Verbindervorrichtung (10) zur Zusammenarbeit mit einem entfernbaren elektronischen Medium (52) versehen mit mindestens einer externen elektrischen Kontaktfläche, wobei die Vorrichtung (10) Folgendes aufweist:

   eine Platte (12) aus Isoliermaterial mit einer ersten Stirnfläche und einer zweiten Stirnfläche, und zwar vorgesehen mit mindestens einem Schlitz (14);
   mindestens ein elektrisches Verbinderelement (16) in der Form einer elastischen leitenden Feder, wobei jedes elektrische Verbinderelement (16) ein Befestigungsende (18) und eine Kontaktierzone (20) aufweist, und zwar zur Kontaktierung einer der externen Kontaktflächen des Mediums;
   mindestens ein elektrischer Verbindungsanschluss (24), wobei der mindestens eine Verbindungsanschluss (24) auf der ersten Stirnfläche der Platte (12) nahe dem mindestens einen Schlitz (14) angeordnet ist;

   wobei mindestens eine Leiterbahn (40) auf der ersten Stirnfläche der Platte (12) vorgesehen ist zur elektrischen Verbindung des Verbindungsanschlusses (24) mit mindestens einer Kontaktkiem-

me; und
wobei das mindestens eine elektrische Verbinderelement (16) mit dem erwähnten mindestens einen elektrischen Verbindungsanschluss (24) über sein Befestigungsende (18) verbunden ist, wobei die Kontaktzone des Teils (20) jedes Verbinderelements (16) von der zweiten Stirnfläche der Platte (12) durch Durchlaufen durch den Schlitz wegragt, und
wobei ferner jedes elektrische Verbinderelement (16) einen das Befestigungsende (18) bildenden ebenen Teil, einen gefalteten die Kontaktzone bildenden Zwischenteil und ein zweites planares Ende aufweist, welches letzteres zum Anschlag an der oberen Stirnfläche der Platte (12) ausgelegt ist, wenn das elektrische Verbinderelement (16) nicht elastisch deformiert ist.

2. Elektrische Verbindervorrichtung nach Anspruch 1, wobei ferner mindestens eine elektronische Komponente (A, B, C) an der ersten Stirnfläche befestigt ist und mit dem mindestens einen elektrischen Verbinderelement (16) verbunden ist.

3. Elektrische Verbindervorrichtung nach Anspruch 1, mit einer Vielzahl von Schlitzen (14.1 bis 14.8), einer Vielzahl von elektrischen Verbinderelementen (16) und einer Vielzahl von Leitungsbahnen (40, 42, 44).

4. Elektrische Verbindervorrichtung nach Anspruch 1, wobei die Platte (12) 2n Schlitze besitzt und wobei die Schlitze in einer Matrix von zwei Zeilen mal n Spalten angeordnet sind.

5. Elektrische Verbindervorrichtung nach Anspruch 4, wobei die Isolierplatte (12) einen zusätzlichen Schlitz (26) aufweist, und zwar versehen mit einem zusätzlichen elektrischen Verbinderelement, welches einen Detektor für das Ende des Hubs bildet.

6. Ein elektrischer Speicherkartenleser unter Verwendung einer elektrischen Verbindervorrichtung gemäß einem der Ansprüche 1 bis 5, wobei der Leser Folgendes aufweist:

eine obere Halbschale;
eine untere Halbschale, die einen Einsetzschlitz für eine elektronische Speicherkarte bildet und ein Innengehäuse zur Aufnahme der Karte; und Mittel zur Befestigung der Isolierplatte der elektrischen Verbindervorrichtung zwischen den Halbschalen.

Revendications

1. Dispositif connecteur électrique (10) pour coopérer avec un milieu électronique amovible (52) muni d'au moins une zone de contact électrique externe, le dispositif (10) comprenant :

une carte (12) de matériau isolant ayant une première face et une seconde face et munie d'au moins une fente (14) ;
au moins un élément connecteur électrique (16) sous forme d'un ressort conducteur élastique ; chaque élément connecteur électrique (16) ayant une extrémité de fixation (18) et une zone de contact (20) pour contacter l'une des zones de contact externe du milieu ;
au moins un plot de connexion électrique (24), ledit au moins un plot de connexion (24) étant disposé sur la première face de la carte (12) près de ladite au moins une fente (14) ;
au moins une piste conductrice (40) formée sur la première face de la carte (12) pour connecter électriquement le plot de connexion (24) à au moins une borne de contact ;
ledit au moins un élément connecteur électrique (16) étant fixé audit au moins un plot de connexion électrique (24) par son extrémité de fixation (18), la zone ou partie de contact (20) de chaque élément connecteur (16) faisant saillie à partir de la seconde face de la carte (12) en passant à travers ladite fente, et
dans lequel chaque élément connecteur électrique (16) comprend une partie plane formant l'extrémité de fixation (18), une partie intermédiaire repliée (20) formant la zone de contact, et une seconde extrémité plane prévue pour porter contre la face supérieure de la carte (12) quand l'élément connecteur électrique (16) n'est pas déformé élastiquement.

2. Dispositif connecteur électrique selon la revendication 1, comprenant en outre au moins un composant électronique (A, B, C) fixé sur la première face et connecté audit au moins un élément connecteur électrique (16).

3. Dispositif connecteur électrique selon la revendication 1, comprenant une pluralité de fentes (14.1-14.8), une pluralité d'éléments connecteurs électriques (16) et une pluralité de pistes conductrices (40, 42, 44).

4. Dispositif connecteur électrique selon la revendication 1, dans lequel la carte (12) comporte 2n fentes, les fentes étant disposées selon une matrice de deux rangées par n colonnes.

5. Dispositif connecteur électrique selon la revendication 4, dans lequel la carte isolante (12) comprend une fente supplémentaire (26) munie d'un élément connecteur électrique supplémentaire formant un

détecteur de fin de course.

6. Lecteur de carte à mémoire électrique utilisant un dispositif connecteur électrique selon l'une quelconque des revendications 1 à 5, le lecteur comprenant :

une demi-coquille supérieure ;
une demi-coquille inférieure définissant une fente d'insertion pour une carte à mémoire électronique et un boîtier interne pour recevoir la carte ; et
des moyens pour fixer la carte isolante du dispositif connecteur électrique entre les demi-coquilles.

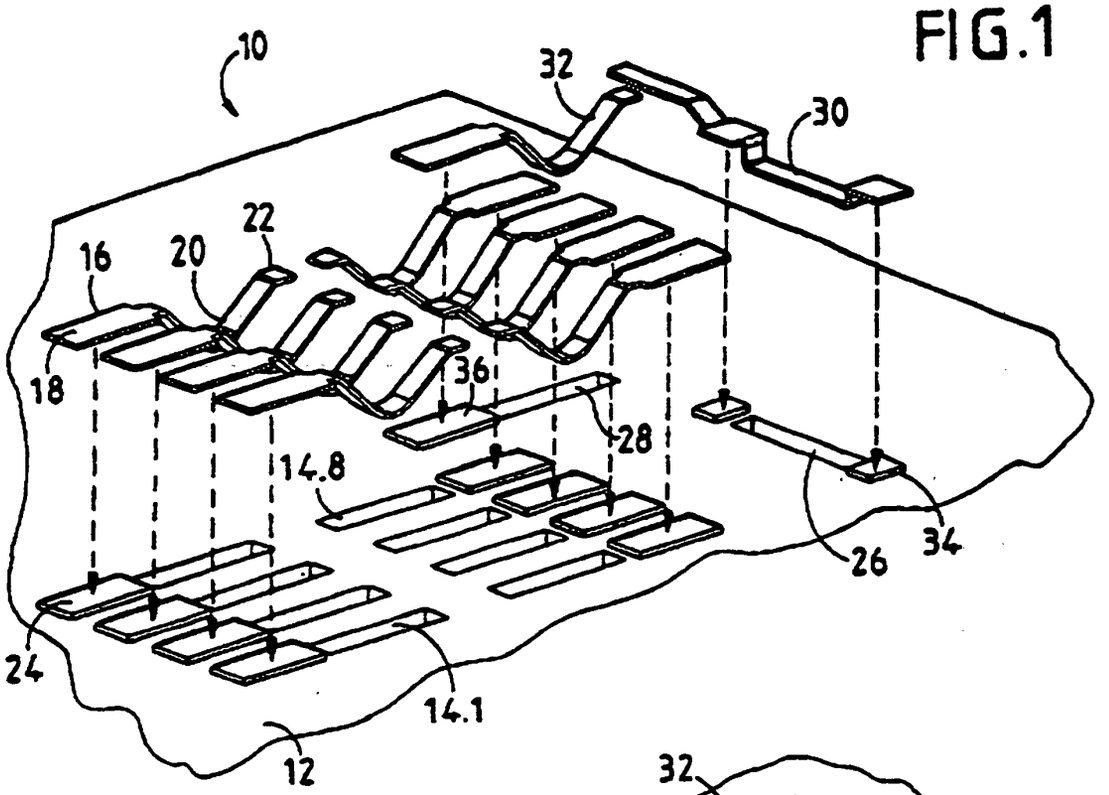


FIG.1

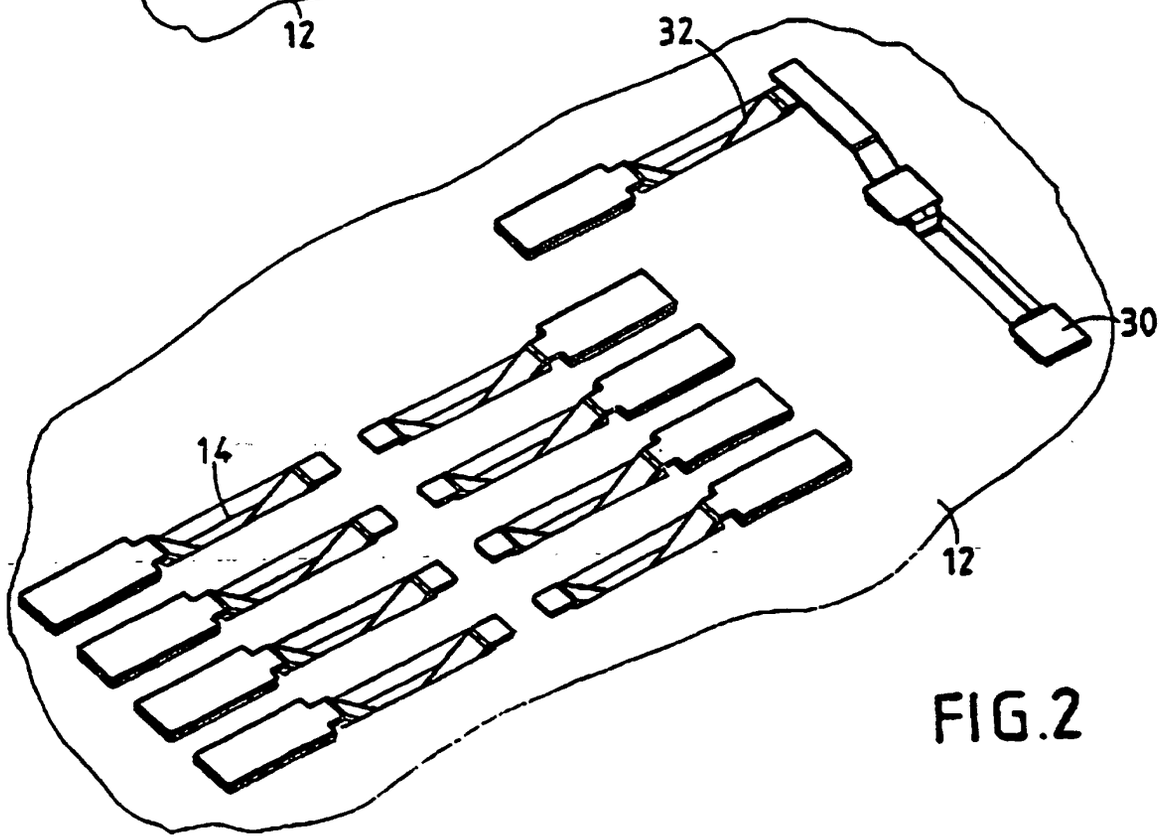


FIG.2

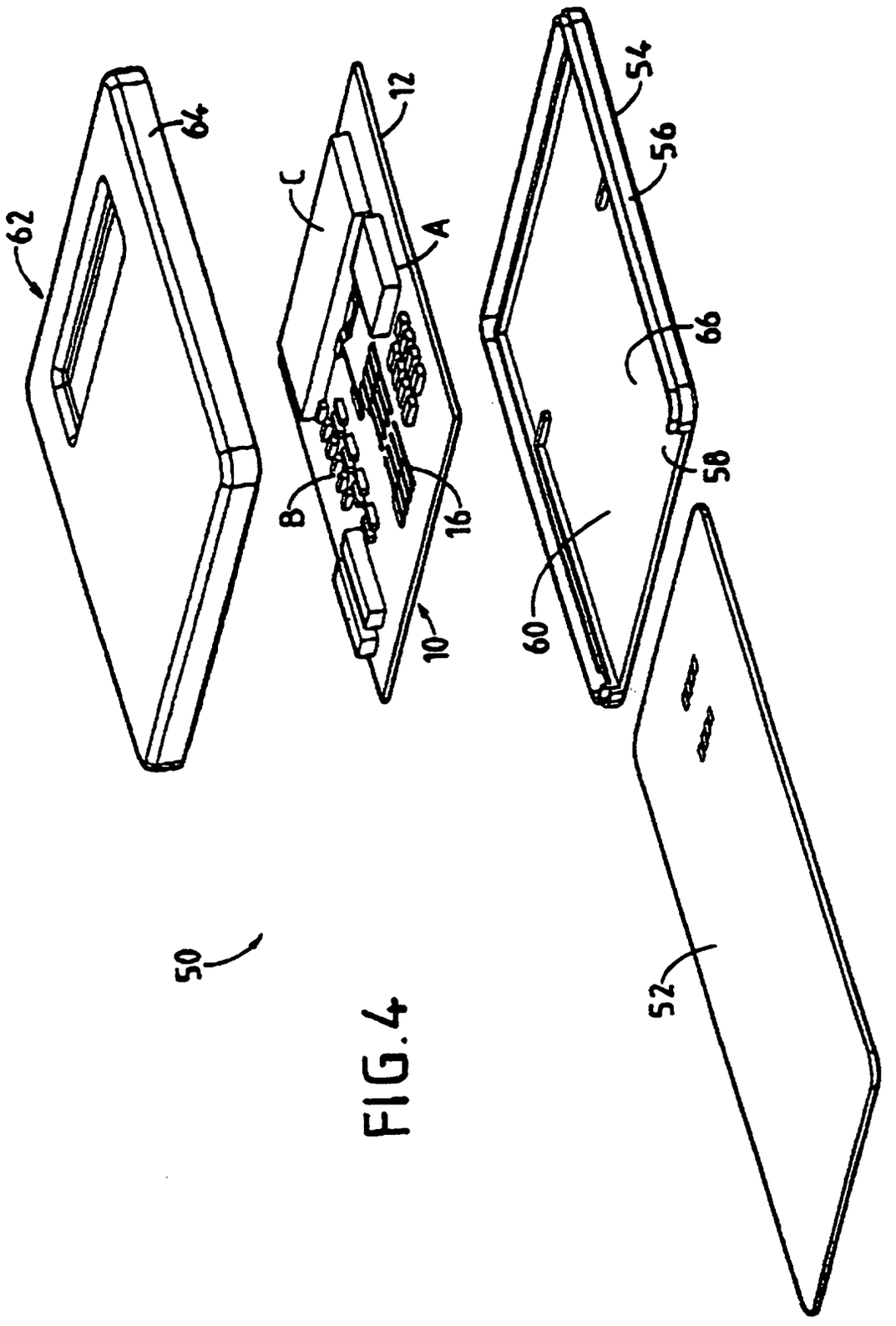


FIG.4

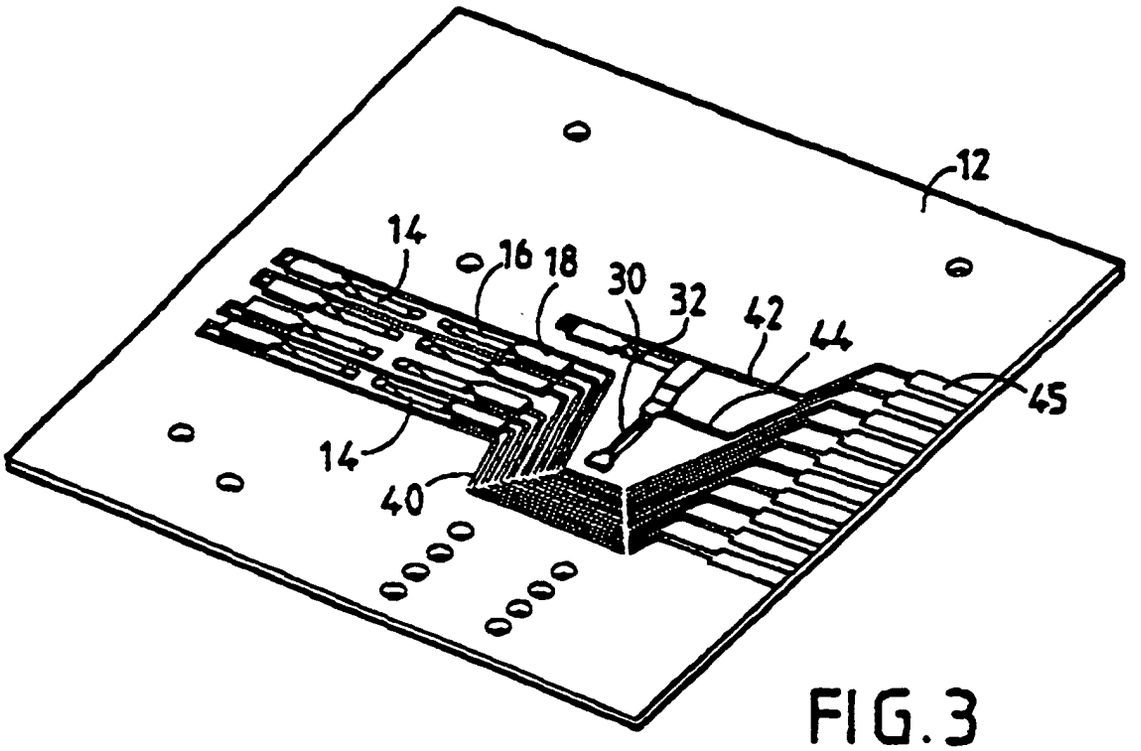


FIG.3

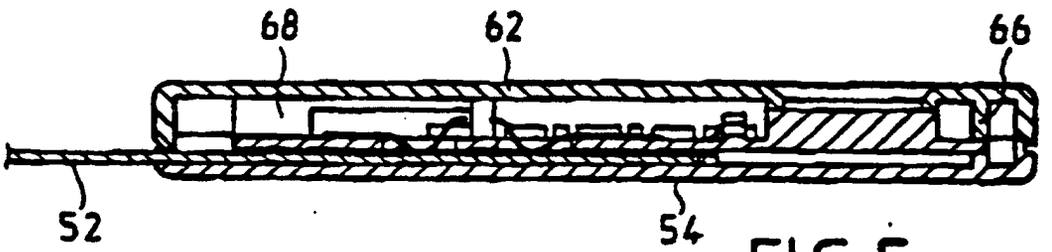


FIG.5

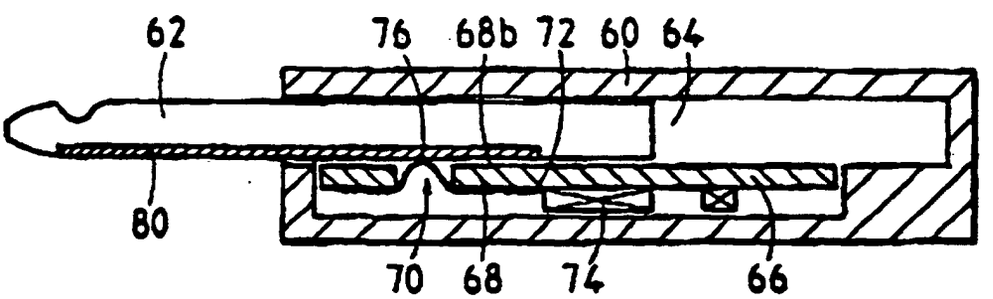


FIG.6